FUNDAMENTAL MANUFACTURING PROCESSES

Turning & The Lathe

SCENE 1.
TU13A, CGS: Basic Lathe Turning
white text, centered on background
FMP01B, motion background

SCENE 2.
TU14A, FMP013, 13:01:46:00-13:02:02:00
pan of engine lathe
TU14B, FMP013, 13:46:54:00-13:47:14:00
zoom out, engine lathe in operation
TU14C, FMP004, 04:33:54:00-04:34:13:00
c.u. high production lathe turning part

NARRATION (VO):

ONE WAY TO ILLUSTRATE THE BASIC PRINCIPLES OF TURNING IS TO EXAMINE THE GENERAL-PURPOSE ENGINE LATHE. THIS MANUAL MACHINE TOOL IS NOW ONLY USED FOR LIMITED PARTS PRODUCTION, BUT IT EFFECTIVELY ILLUSTRATES THE BASIC PRINCIPLES OF TURNING. MOST OF THESE PRINCIPLES ARE ALSO RELEVANT TO HIGH-PRODUCTION, AUTOMATED LATHES.

SCENE 3.
TU15A, FMP013, 13:56:36:00-13:57:12:00
chuck with workpiece being turned, tool post brought in, facing operation, edit at multiple points

NARRATION (VO):

BASIC REQUIREMENTS FOR LATHE WORK INCLUDE A MEANS FOR HOLDING AND ROTATING WORKPIECES...,
AND A MEANS FOR HOLDING AND MOVING CUTTING TOOLS.

SCENE 4.
TU16A, FMP013, 13:07:52:00-13:08:31:00
workpiece in chuck, starting to spin
zoom in turning

NARRATION (VO):

A WORKPIECE APPROPRIATE FOR TURNING IS USUALLY CYLINDRICAL OR AT LEAST RELATIVELY SYMMETRICAL ALONG ITS MAIN AXIS. IT IS GRIPPED IN THE LATHE AT ONE OR BOTH ENDS, AND ROTATED. CUTTING TOOLS OF VARIOUS SHAPES ARE FED INTO THE ROTATING STOCK,

REMOVING MATERIAL.

SCENE 5.
TU17A, FMP014, 15:13:38:00-15:13:50:00
spindle
TU17B, CGS: Spindle
TU17C, CGS: arrow
TU17D, FMP014, 15:13:18:00-15:13:32:00
headstock
TU17E, CGS: Headstock
TU17F, FMP013, 13:30:42:00-13:30:51:00
pan, gear train

NARRATION (VO):

ROTATION IS PROVIDED BY A SPINDLE...,

WHICH IS MOUNTED IN THE HEADSTOCK.

THIS SPINDLE IS DRIVEN BY A MOTOR AND GEAR TRAIN.

SCENE 6.
TU18A, SME2518, 01:06:43:00-01:06:47:00
chuck holding workpiece
TU18B, SME2518, 01:21:55:00-01:21:59:00
collet placed in spindle
TU18C, SME2645, 04:04:11:00-04:04:14:00
mandrel holding part
TU18D, SME2644, 03:19:07:00-03:19:16:00
between centers turning with lathe dog
TU18E, SME2650, 01:01:10:00-01:01:15:00
turning with face driver

NARRATION (VO):

LATHE WORKHOLDING DEVICES INCLUDE THE CHUCK...,

COLLET...,

MANDREL...,

AND A MEANS OF ROTATING THE WORK FOR BETWEEN-CENTER TURNING, SUCH AS A LATHE DOG...,

OR A FACE DRIVER.

--- TOUCH BLACK ---

SCENE 7.
TU19A, FMP013, 13:27:15:00-13:27:30:00
empty spindle
TU19B, FMP013, 13:28:12:00-13:28:21:00
chuck on spindle
TU19C, SME2518, 01:04:56:00-01:05:10:00
part placed in three-jaw chuck
TU19D, SME2644, 03:14:45:00-03:14:56:00
2-jaw chuck holding non round part
TU19E, SME2644, 03:14:16:00-03:14:26:00
4-jaw chuck jaws being adjusted independently

NARRATION (VO):

CHUCKS ATTACH TO THE SPINDLE NOSE OF THE LATHE, AND ARE EITHER MANUALLY OR POWER OPERATED. THREE-JAW OR ‘UNIVERSAL’ CHUCKS ARE THE MOST COMMON. THE CHUCK’S THREE JAWS MOVE TOGETHER TO CENTER AND CLAMP A ROUND WORKPIECE. IRREGULAR WORKPIECES MAY BE HELD IN TWO...,

OR FOUR-JAW CHUCKS, IN WHICH THE JAWS ARE ADJUSTED INDEPENDENTLY.

SCENE 8.
TU20A, SME2520, 03:06:58:00-03:07:24:00
collet being placed into spindle, work placed in collet, collet tightening, edit at multiple places
TU20B, FMP013, 13:50:30:00-13:50:45:00
zoom out, collets
TU20C, SME2645, 04:06:11:00-04:06:16:00
square collet, part placed in it

NARRATION (VO):

COLLETS, WHICH USUALLY SEAT IN THE SPINDLE OF THE LATHE, ARE HOLLOW CYLINDRICAL DEVICES WITH SLOTS ALONG MOST OF THEIR LENGTH. A COLLET OPENS UNDER ITS OWN SPRING TENSION AND IS CLOSED SECURELY TO GRIP THE STOCK ON-CENTER. THE MOST COMMON TYPE OF COLLET GRIPS CYLINDRICAL BAR STOCK, BUT THERE ARE COLLETS FOR SQUARE AND OTHER SHAPED STOCKS.

SCENE 9.
TU21A, SME2648, 21:19:32:00-21:19:40:00
multisize collet
TU21B, SME2643, 02:02:35:00-02:02:43:00
part turning in multisize collet

NARRATION (VO):

SOME COLLETS ARE MULTISIZED, AND CAN ACCOMMODATE A RANGE OF FRACTIONAL, DECIMAL, METRIC, AND NON-STANDARD BAR SIZES.

SCENE 10.
TU22A, SME2644, 03:25:59:00-03:26:15:00
mandrel expanding to hold part, turning
TU22B, SME2645, 04:04:11:00-04:04:11:01
freeze frame, thin part held by mandrel
TU22C, SME2645, 04:05:00:00-04:05:12:00
thin part in mandrel, being turned

NARRATION (VO):

MANDRELS, ALSO CALLED ARBORS OR EXPANSION COLLETS, EXPAND TO GRIP ROTATIONAL PARTS FROM THE INSIDE DIAMETER. A MANDREL WORKS WELL FOR THIN-WALLED WORKPIECES AND ALLOWS ACCESS TO THE FULL EXTERIOR OF THE WORKPIECE.

SCENE 11.
TU23A, SME2520, 05:05:35:00-05:05:48:00
long shaft being turned
TU23B, SME2519, 02:07:56:00-02:08:00:00
center holes on ends of stock, loop if necessary
TU23C, SME2518, 01:24:00:00-01:24:10:00
tailstock with conical pin
TU23D, SME2519, 02:08:04:00-02:08:13:00
move tailstock, place work between

NARRATION (VO):

LONGER PARTS, SUCH AS SHAFTS, MAY REQUIRE ‘BETWEEN-CENTER’ TURNING, IN WHICH BOTH ENDS OF THE PART ARE SUPPORTED. THIS METHOD REQUIRES A CONICAL CENTER HOLE TO

centers
TU23E, SME2644, 03:18:40:00-03:19:00:00
drive dog turning shaft
TU23F, SME2520, 05:04:56:00-05:05:10:00
center mount in headstock spindle

BE DRILLED INTO THE TAILSTOCK END OF THE WORKPIECE PRIOR TO TURNING. THIS END OF THE WORKPIECE CAN THEN BE SUPPORTED BY A CENTER THAT IS MOUNTED IN THE TAILSTOCK, WHILE THE HEADSTOCK END IS GRIPPED BY A CHUCK OR COLLET, OR SUPPORTED BY A CENTER MOUNTED IN THE HEADSTOCK SPINDLE.

SCENE 12.
TU24A, SME2520, 05:04:40:00-05:04:53:00
headstock as work turns
TU24B, SME2519, 02:09:28:00-02:09:39:00
live center
TU24C, SME2519, 02:10:19:00-02:10:28:00
dead center

NARRATION (VO):

HEADSTOCK CENTERS ALWAYS ROTATE WITH THE LATHE SPINDLES AND THE WORKPIECES, WHILE TAILSTOCK CENTERS MAY BE EITHER 'LIVE', ROTATING WITH THE WORKPIECE...,
OR 'DEAD', REMAINING STATIONARY.

SCENE 13.
TU25A, SME2644, 03:23:25:00-03:23:44:00
zoom out, steady rest assisting between centers turning

NARRATION (VO):

IF THE WORK IS LONG AND REQUIRES MORE SUPPORT TO RESIST THE CUTTING FORCES, A STEADY REST MAY BE USED TO MINIMIZE DEFLECTION AWAY FROM THE CUTTING TOOL.

SCENE 14.
TU26A, SME2650, 01:01:08:00-01:01:16:00
c.u. face driver, freeze last frame
TU26B, SME2650, 01:01:41:00-01:01:53:00
c.u. face driver, part secured to it
TU26C, SME2650, 01:03:27:00-01:03:36:00
med, face driver turning

NARRATION (VO):

ANOTHER TECHNIQUE TO TURN SHAFTS IS TO USE A FACE DRIVER--A TOOL WITH A CENTER POINT AND SEVERAL DRIVING PINS, WHICH DIG INTO THE END OF THE SHAFT. THE FACE DRIVER PROVIDES THE TORQUE, WHILE A LIVE CENTER, HELD IN THE TAILSTOCK, PROVIDES SUPPORT.

--- TOUCH BLACK ---

SCENE 15.
TU27A, FMP013, 13:21:41:00-13:22:04:00

NARRATION (VO):

cutting tool being fed into work
TU27B, FMP014, 15:01:15:00-15:01:33:00
static, carriage, cross slide and compound rest
TU27C, CGS: Carriage
TU27D, CGS: Cross Slide
TU27E, CGS: Compound Rest

CUTTING TOOLS BROUGHT TO THE ROTATING WORK MAY MOVE IN ONE OR MORE DIRECTIONS. THE BASIC TOOL MOVEMENTS ON AN ENGINE LATHE ARE ACCOMPLISHED WITH THE CARRIAGE, CROSS SLIDE, AND COMPOUND REST.

SCENE 16.
TU28A, FMP014, 15:06:10:00-15:06:44:00
med, carriage traveling in the z axis, stopped
TU28B, CGS: Z Axis
TU28C, CGS: z axis arrows

NARRATION (VO):

THE CARRIAGE AND APRON ASSEMBLY ON AN ENGINE LATHE TRAVELS ALONG THE BEDWAYS PARALLEL TO THE WORKPIECE AXIS, KNOWN AS THE 'Z' AXIS.

SCENE 17.
continue previous shot, zoom into cross slide as it is moved in x axis
TU29A, CGS: X Axis
TU29B, CGS: x axis arrows

NARRATION (VO):

MOTION PERPENDICULAR TO THE WORKPIECE AND LATHE AXIS IS CALLED THE 'X' AXIS. ON AN ENGINE LATHE, THIS MOTION IS PROVIDED BY THE CROSS SLIDE, ON TOP OF THE CARRIAGE.

SCENE 18.
TU30A, FMP014, 15:08:22:00-15:09:00:00
compound rest being rotated and secured
TU30B, FMP014, 15:10:08:00-15:10:26:00
c.u. tool post being secured
TU30C, CGS: Tool Post
TU30D, FMP014, 15:02:55:00-15:03:10:00
zoom in, drill mounted in tailstock
TU30E, CGS: Tailstock

NARRATION (VO):

ON THE CROSS SLIDE IS THE COMPOUND REST, WHICH CAN BE ROTATED TO ANY ANGLE AND SECURED. IT ALLOWS MOVEMENT AT AN ANGLE TO THE WORKPIECE AXIS AND CARRIES THE TOOL POST, WHERE TOOLS ARE MOUNTED. OTHER TOOLS MAY BE MOUNTED IN THE TAILSTOCK FOR END-WORKING OPERATIONS.

--- FADE TO BLACK ---

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